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FARM, RANCH AND HOME

QUARTERLY

SUMMER 1982



Institute of Agriculture
and Natural Resources
The University of Nebraska-Lincoln



The Northeast Station—

An Anniversary

See Page 3



Roy G. Arnold
Vice Chancellor

An Investment Returned

A quarter of a century ago, it became apparent that there was a real need for research into agricultural problems peculiar to the northeast section of our state.

Concern about those problems, as well as the future of agriculture in the region, prompted a number of area citizens to become involved in helping the University to help them. The Northeast Nebraska Experimental Farm Association was formed.

The movement to provide land and equipment for a research/education center mushroomed and, through the efforts of many area residents, nearly 2,000 contributors bought memberships to help found what has become IANR's Northeast Station at Concord.

The returns on those early investments by individual citizens have, indeed, been astronomical. Concerns of those early NNEFA members, ranging from irrigation practices to swine housing, have been addressed and progress has been made. Conservation of soil resources received particular emphasis in the programs of the Northeast Station.

Elsewhere in this issue you will find an article detailing the Northeast Station's first 25 years of service.

While it is pleasing to look at our accomplishments—particularly at the time of a major anniversary—we cannot afford to dwell too long on the returns that have been made on our investments in research and education.

We must face the realities of 1982 and beyond. At a time when Nebraska agriculture faces major challenges, budget restrictions have forced reductions in staffing in some program areas. Prospects for increased support in the near future are limited.

These restrictions will have an impact on our ability to address future problems—in all areas of the state and in all areas of agriculture and natural resources.

The continued interest and support of Nebraska citizens and organizations like the Northeast Nebraska Experimental Farm Association will be essential for the continuation of IANR's strong research and education programs to meet these future challenges.

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Research results of the Nebraska Agricultural Experiment Station are available to anyone regardless of race, color, religion, sex or national origin.

COVER:

From the air, the Northeast Station near Concord, Nebraska looks much like the rest of its companion cropland. But a closer examination reveals test plots, research facilities and projects and a headquarters for University of Nebraska research and Extension activity in northeast Nebraska. The station celebrates its 25th anniversary this year. The story follows on page 3. (Photo by Bart Stewart.)



The Northeast Station... 25 years of Research, Extension and Service

This aerial view of the Northeast Station at Concord shows the diverse terrain of the area.

For the past 25 years, the Northeast Station at Concord has served as the cornerstone of University of Nebraska agricultural research and Extension activity in northeast Nebraska. This year marks the twenty-fifth anniversary of the founding of the station and commemorates the dedication of the citizens of this area in their commitment to its success.

While the land the station occupies may not look different from its surroundings, its purpose is. The Northeast Station operates as a part of a statewide agricultural experiment station and Cooperative Extension Service network. The mission of the station is to research agricultural topics that are important to northeast Nebraska and to provide this and other available information to farmers, their families and other interested people.

This article was compiled from information provided by the faculty and staff of the Northeast Station. Coordination of the material came from Cal J. Ward, director. Photography for the article was by Bart Stewart, Ag Communications, University of Nebraska-Lincoln.

Station History

The beginnings for the Northeast Station came in December of 1954 when local citizens formed the Northeast Nebraska Experimental Farm Association. The Association was organized for the sole purpose of obtaining an experiment station to serve the northeast part of the state.

The original idea for the experiment station came from Rollie Ley, a Wayne banker. Albert Watson, also of Wayne, played a prominent part in organizing the Association. He served as temporary chairman during the organization period and as the Association's first president. Other officers during the first year were Walter Chace of Pilger, Willard Burney of Hartington and R. Chester Graff of Bancroft.

The Association was incorporated in 1955. As a part of the articles of incorporation for the organization, the main purpose of the group was to "promote, encourage and procure the establishment and operation of an experimental farm in northeast Nebraska; to solicit and

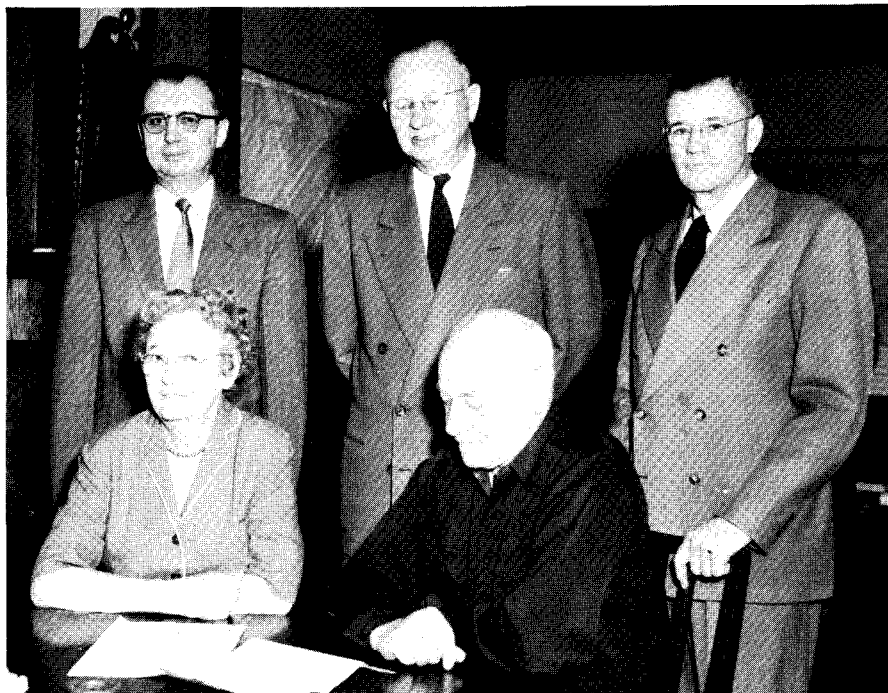
secure funds by gifts, donations or otherwise to be used in acquiring, owning and providing suitable land and to hold, give or convey same to an institution such as the University of Nebraska to be used and operated as an experimental farm . . ."

The Association arranged a fund-raising campaign organized in each county to raise money for the purchase of a farm to then be given to the University for research. Through the sale of \$25 memberships and gifts, nearly \$40,000 was raised during 1955.

The first major financial contribution was the gift of a 320-acre farm valued at approximately \$70,000 in 1956. This farm was given to the University of Nebraska by the C. D. Haskell family through the arrangement of the Association. In exchange for the land donation, the Association also agreed to set up a scholarship fund through the NU Foundation in the name of Margaret T. Haskell. A \$25,000 fund was created to provide interest-free or low-interest loans to northeast Nebraska

(Continued on next page)

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From the beginnings of the Northeast Station: left to right, standing, Dr. E. F. Frolik; Perry Branch; Albert Watson, first president of the Northeast Nebraska Experimental Farm Association; seated are Mr. and Mrs. C. D. Haskell.

male students majoring in agriculture or engineering at the University.

As plans were made for developing buildings on the new station land, C. D. Haskell came forward again. He challenged the Association to raise additional funds to build a headquarters and other buildings and promised to match any additional funds raised by the Association. The Association raised \$8,850 and Haskell matched that amount with funds of his own.

Richard Adkins, of Osmond, was a member of the University Board of Regents and a member and supporter of the Northeast Station. Through his efforts and by using the local contributions as proof of public interest, University funds were allocated to build the headquarters building.

The Association continued in its developmental role by loaning the station money to purchase the first lots of cattle for experimental use and by giving \$4,000 to help purchase three upright silos.

In 1967, the Association cooperated with the local pork producers in another fund drive which raised

\$22,000 for building a swine research facility at the station.

The Association has continued to provide small grants annually for special needs, including funding for special 25th Anniversary Field Day activities. Throughout the years, the support of northeast Nebraskans has been evident. Nearly 2,000 individuals have purchased memberships or given donations to the Northeast Station.

Research and Extension

Research and Extension activities at the Northeast Station center on the particular needs of northeast Nebraska. The station houses a team of 12 University faculty members and additional support staff whose activities cover most of the agricultural subject areas. The Cooperative Extension Service function of the station is channeled through the Extension offices in each county in the Northeast district.

Research has been centered on numerous topics at the Northeast Station including pasture improvement, swine housing and management, conservation tillage, dairy

cattle, forestry, 4-H and youth development, beef cattle, soil conservation and irrigation, entomology, weed control and crop variety testing, and soil fertility. Highlights of these research areas follow:

Pasture Improvement

Pastures have always been an important component of the farm enterprises in northeast Nebraska. Yet, through the years, they have often been characterized as our most abused crop. Although a large part of the research program in northeast Nebraska has been devoted to corn production, the subject of pasture improvement has received some consideration.

Early pasture improvement research was conducted at various farm sites throughout northeast Nebraska and involved variety and fertilizer requirements. Major research was also done on the response of brome grass to fertilization. Research on the response of other pasture grasses to fertilizer also followed.

Through the years, research has shown that fertilization was one management input that could substantially increase production from the abused pasture acres. With farmer needs for beef production results, limited grazing studies were conducted to measure the effect of fertilization in terms of the amount of beef produced.

While research has shown that management practices such as fertilization, rotational grazing and weed control could improve production from many pasture acres, some had been abused to the extent that renovation was needed. This need has resulted in initiation of new avenues of pasture management research being conducted now. Research is being directed to development of systems where either grasses or grass/legume mixtures can be seeded into abused pastures with the use of minimum tillage techniques.

Swine

Research in swine housing and management at the Northeast Station began in 1968 and was limited



Extension swine specialist Mike Brumm shows pigs used to test different rations and management practices for newly received feeder pigs.



David Shelton, Extension engineer records the temperature in a hog house on a tape recorder, which in turn feeds into a computer for analysis.

to the growing-finishing phase of production.

Research included study of the modified open-front concept of housing, the slatted floor concept, a study of odor levels in different housing types; the effects of slatted floors on ulcer incidence or respiratory incidence; how continuous light effects growing-finishing; feet and leg problems of pigs, bone breaking strength, bleeding pig disease, and tail biting.

Since 1979, research efforts have focused on management of the stressed feeder pig and energy conservation techniques for the early weaned pig.

Research has included the performance of purchased pigs (at both local or distant markets); receiving diets of purchased pigs; and swine housing of weaned pigs.

Conservation Tillage

Soil conservation was one impetus for the establishment of the Northeast Station. The sloping hills and highly erodable soils of this area have made soil erosion concerns a major program throughout the station's history. These programs have included both research and demonstration of conservation structures, such as terraces, and reduced or conservation tillage.

Research on conservation tillage at the Northeast Station has centered on herbicide selection and comparison, fertilizer requirements and placement, and erosion control comparisons for various tillage and planting systems. Extension programs have covered these areas, as well as fuel and labor comparisons for various tillage systems.

In 1979, a study was initiated to evaluate the soil erosion control potential of conservation tillage systems in oat residues, since oats are an important Northeast Nebraska commodity. Four tillage systems, moldboard plow, disk, stubble mulch or undercut, and no-till were included in the study.

Since continuous corn is common in Northeast Nebraska, a study involving five common tillage systems

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was conducted to measure erosion control effectiveness.

Conservation tillage can be an effective means of reducing soil erosion as well as fuel and labor requirements for crop production. Research at the Northeast Station has been devoted to assessing the effectiveness of conservation tillage systems, and developing and testing management techniques to make these systems practical. Without a doubt, the activity in this area will continue to be an important component of our total program.

Dairy

Northeast Nebraska has been a major dairy producing area for many years with one-third of the state's dairy cows located in this area.

The changes in the dairy industry that have taken place in the last 25 years have created a real need by producers for technical assistance.

Early in this period, record keeping and basic management were stressed. Then buildings and equipment changes were important as bulk milk became law. After this, registered cattle and business organization became vital because of expansion and second generation involvement.

On-farm demonstrations and research have included lead feeding, magnet feeders, worming, forage testing and ration building, reproductive herd health programs and currently an effort in mastitis control and overall management.

The mastitis program which began three years ago includes 32 demonstration herds and a full-time technician in an interdepartmental effort which is statewide but coordinated from the Northeast Station. This program has generated over \$250,000 of outside support and is being cited as a model on the national level.

A major effort in the dairy program has been organizational help to local producers. Assistance has been given breed groups, the Nebraska Dairy Women, A.I. organizations, DHIA groups, the central testing laboratory, the farm business

association, young cooperators group and the organization of a herd health program in addition to the mastitis control program.

A constant effort has also been made to upgrade and demonstrate new and effective teaching methods. Up to 50 meetings at 25 locations in 12 days, reaching one-third of the dairymen producing two-thirds of the state's milk has been accomplished by using multimedia and the conference telephone. Similar programs have been used during the last three years.

The dairy program will continue to adjust to meet the ever changing needs of the dairy industry in northeast and the rest of Nebraska.

Forestry

The northeast district Extension forestry program began in 1958 to improve the forest resources and to increase the acreage of forest resources in the district.

Each year emphasis has been on the Clarke-McNary Tree Program. The program offers tree seedlings to the landowner each spring for planting to control soil and water erosion, wildlife habitat, woodlot plantings, recreation and Christmas tree production. Since 1958, approximately 12 million seedlings have been sold to the cooperators in the district. The last several years have seen an increase in the number sold each year.

For the past five years, emphasis has been placed on increasing the survival rate of the tree plantings each year. Additional publicity on site preparation before planting, storage and handling of trees, improved tree planting practices and weed control after planting increased the average tree survival from about 50 percent to over 80 percent each year. Training meetings for other public agencies' staff that are involved in the tree planting program have been presented each year. About 90 percent of the trees planted in the district are planted by Natural Resources District tree planting crews.

During the last 10 years, the conversion to self-propelled irrigation systems for farming has resulted in reduced areas of windbreaks and woodlots. Trees were removed from the fields and the land use changed to cropland. After the irrigation systems are installed, a few corners in the fields are planted to trees. The number and acreage of field windbreaks planted each year has declined during this period.

The tree resources of each community of the district are not receiving proper management. Five years ago, the Community Forestry Program was begun to create awareness in the community of the forest resources and assist with tree removal, tree planting and maintenance of the



Extension forester Dick Gavit shows northeast Nebraska residents the benefits of farmstead windbreaks for home and livestock protection.

present trees. The forester advises the city government on the public owned trees, not the trees on private property. Twenty-five communities in the northeast district are provided assistance.

Beef Cattle

The beef cattle research program at the Northeast Station was established in 1959 to improve the efficiency of utilization of feedstuffs which are available to livestock producers in northeast Nebraska. Currently the station has facilities to feed approximately 400 head of cattle. Facilities include a number of dry corn bins, oxygen limiting storage bins and three bunker silos, plus necessary feed mixing and weighing equipment required for research.

Much of the beef cattle research conducted at the station in the 1960's was concerned with the protein needs of growing and finishing cattle, performance and feed efficiencies of cattle, the addition of enzymes to feedlot rations, the effects of diethylstilbestrol and synovex on feedlot cattle, and the feeding value of drought damaged corn.

By the late 1960's and early 1970's, much research was being conducted with high moisture corn and roughage utilization.

From 1975 to 1981, studies at the station were conducted to assess the supplemental protein value of alfalfa and the effect of bacterial and acid preservatives on corn and alfalfa silages.

Currently studies are being conducted to determine levels of alfalfa haylage and silage needed in corn silage rations to optimize gains and feed efficiencies of growing feedlot steers.

The beef cattle research conducted at the Northeast Station over the past 25 years has provided useful and pertinent information for the beef cattle industry. Through the solid support of many beef cattle producers in northeast Nebraska, much of the research at this station has been conducted in a manner that meets the needs of the producer and yet increases our overall understanding of the beef animal's nutritional requirements.



Extension beef specialist Terry Mader examines corn silage as he evaluates various systems of harvesting and storing home grown feeds for beef cattle.

Youth Programming

Four-H project camps added a new dimension to 4-H club work in the northeast Nebraska. The project camps were designed to supplement the work of the 4-H leader and to encourage enrollment in 4-H projects.

These camps have been held at the Northeast Station and in county fair facilities.

Since 1970, a total of 43 camps have been held with over 800 youth participating. These camps have included dairy, crops, plant science, swine, bees, livestock judging, foods, entomology, sheep, tractor, horse, poultry, photography and junior leader.

Four-H members are willing and able to tackle tough problems facing youth. This was evident as 4-H Junior Leaders in northeast Nebraska developed the "Reflections in a Glass" program to place emphasis on the problem of alcohol use among youth.

The program was developed initially as a result of an "Image and Needs Assessment Survey" conducted in Madison County in 1978. Alcohol and drugs among youth were identified as a major concern.

The basic philosophy of the program was that teenage youth could effectively educate their peers and younger youth about alcohol.

Older 4-H members received training at two overnight workshops. They received information about alcohol use and misuse and were provided with techniques they could use in making presentations to other youth groups.

Team members involved in this project made over 125 presentations with over 3,200 youth and adults in attendance. These presentations included school classes, junior leader groups, PTA groups, church groups, 4-H and Home Extension Council Health Awareness Conference and the state fair.

Each year over 2,000 adults become new 4-H leaders, however, almost half of these new leaders do not continue beyond the first year.

A study of the new 4-H leaders in northeast Nebraska was started in 1980 to determine why these leaders decide not to continue in the leadership role and if there were differences between these leaders and those who continued as leaders.

The study revealed that most 4-H leaders are being recruited by the present 4-H leader, they may offer

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their services, to the leader or they are asked by the 4-H members.

Those adults that continued as leaders did so because their children were in 4-H, they believed that 4-H is an important youth program, they liked to work with young people and they learned new skills themselves. Many of those adults who did not continue as leaders indicated that their work took all of their time. They also indicated a dissatisfaction because of lack of parent cooperation and the amount of time required for the task.

The study revealed no significant differences between current and past leaders and their sex, occupation, education level, living location and if they were former 4-H members. The study did show that slightly less than half of the individuals have education beyond high school and that those new leaders who were under 30 and over 50 years of age were more likely to discontinue as leaders.

A current study looking at the influence of 4-H on advanced training, careers, and leadership roles in adulthood. Four hundred and ninety-nine former 4-H'ers who were born between 1944 and 1954 from Boyd, Stanton, Antelope, Cedar, Holt and Madison were selected to participate in this study.

Soil Conservation

Soil conservation has been a major interest at the Northeast Station from the outset. Early work demonstrated the till-plant system of crop production. This system prepared the seedbed by scalping the ridge left by the old crop row, pushing the residue aside, and leaving a protective cover of crop residue on and mixed in the surface layer between rows. Seedbed preparation and planting were completed in the same operation.

Watershed studies in the early '70's concluded that a 90 percent reduction in soil loss could be realized by using the till-plant system on the contour compared to conventional tillage in straight rows.

Irrigation

Irrigation has become an important area of research at the Northeast Station in recent years. Over 6,000 irrigation wells have been registered in the thirteen counties supplying water to nearly 4,500 center pivot irrigation systems. Most of the center pivot systems are placed on the sandy soils in the western portion of the district with the remainder installed on the sloping uplands in the loess hills of the east. Proper management in both areas includes both irrigation scheduling techniques and soil conservation practices.

Since 1980, the northeast district has expanded the irrigation scheduling emphasis by encouraging the completion of the transfer of irriga-

tion scheduling technology by promoting the organization of several irrigation scheduling associations.

Research is currently underway to learn which combinations of tillage practices and sprinkler nozzle types will allow the irrigator to minimize runoff under center pivot sprinklers thus conserving water, energy, and soil resources.

Entomology

The entomology program at the station has assumed a leadership role in the research on the biology and control of the European corn borer and limited emphasis on the research of potential insect pests of soybeans and the biology and control of corn rootworms.



Tom Dorn, Extension irrigationist, evaluates the evaporation pan as a simplified irrigation scheduling device.

Investigations into other areas of concern include the cataloging of insects common to Nebraska soybeans. This study is being partially funded by the Nebraska Soybean, Development, Utilization, and Marketing Board.

The Northeast Station is one of only two districts in Nebraska where University efforts are being concentrated to demonstrate to farmers and stockmen the principles of Integrated Pest Management on their agricultural lands and feedlots. The primary activity is in the training and supervision of insect field scouts.

Meetings are held during the winter to promote the IPM concept and to schedule scout training sessions. Scout training sessions are held in late winter and early spring with emphasis on scouting techniques and insect identification.

Later in the growing season twilight tours and in-field training sessions are held to keep growers and field scouts up-to-date with current insect conditions. Additional information is made available through the use of a weekly newsletter, radio tapes, newspaper articles and televi-

sion appearances. Training sessions are aided by the use of an extensive insect collection of color slides and preserved specimens that have been collected over the years.

Present programs deal mainly with corn and feedlot insect pests. Time has also been spent promoting the IPM concept with grower organizations and agri-business groups.

Another long range Extension program deals with demonstrating the concept of counting rootworm beetles in late summer with the intent of identifying those fields with minimal possibility of rootworm larval damage if again planted to corn.

Weed Control

Agriculture is often described as a controversy with weeds. Weeds are a factor in the management of all land resources but their impact is greatest in agriculture. Every geographic area is plagued by a complex of weed species therefore it is legitimate to be engaged in this weed war.

Over the past dozen years, a strong weed control program has been developed at the Northeast Station. Part of this effort is the annual evaluation of herbicide performance in corn and soybeans, the principal row crops grown in northeast Nebraska. From the applied research come herbicide recommendations to assist our agricultural producers in staying ahead of weed growth. These herbicide evaluation experiments also permit University weed researchers to look at experimental herbicide compounds. Often these new compounds find their way into the market place and become a basic part of weed control practices.

Weed control is often identified as a major obstacle to farmer adoption of conservation tillage crop production systems. The weed science program at the Northeast Station has been partially directed toward investigation of weed control in several conservation tillage systems. One example has been to compare weed control in the till-plant and the slot-plant systems of corn production.

Slot-planting is essentially a no-till corn production system which has



Russ Moomaw, Extension agronomist, studies the effectiveness of herbicides on corn seeded into oat stubble from the previous year.

attracted some interest and a few advocates in northeast Nebraska to reduce soil erosion losses. Research effort has also been directed toward developing weed control practices in no-till corn production in alfalfa sod and oat stubble. Soybeans can also be grown in such systems with the proper choice of a herbicide program.

Pasture is also a valuable resource in northeast Nebraska. Research effort has been directed toward using better weed control practices while establishing cultivated grass seedings, or to control weed growth in existing pasture land. Problem pasture weeds like leafy spurge need an expanded research effort.

Crop Variety Testing

Crop variety testing programs have received continual emphasis at the Northeast Station. Corn, soy-

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Pest management scout supervisor Keith Jarvi empties a light trap used to monitor European corn borer activity.

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beans, alfalfa, oats, barley, winter and spring wheat and sunflower variety performance tests are currently being conducted to keep farmers supplied with new and better varieties. The results of these tests are published annually in the Nebraska Cooperative Extension Service series of crop variety performance circulars.

Soil Fertility

Soil fertility research at the Northeast Station has been as varied as the soils and cropping systems used in northeast Nebraska.

Early soil fertility studies were directed toward determining fertilizer rates needed to produce maximum economic yields of corn, small grains and forage crops grown in the area.

As staff was added to the facility,

the activity in soil fertility research increased. Studies were expanded into the sandy soils of the area. Research was also initiated to measure the effectiveness of micronutrients for crop production on all soils in the area.

The face of crop production in northeast Nebraska changed in the late '60's when center pivot irrigation entered the crop production picture and irrigated acreage expanded rapidly. The expansion continued into the early '70's.

Soil fertility research was then expanded to include investigations into fertilizer management for irrigated corn, irrigated alfalfa, and irrigated pastures.

It's important to point out that the soil fertilizer research conducted at the Northeast Station throughout the years has not been independent of other research conducted throughout the state. The large majority of the studies undertaken have been coordinated with other researchers

at the other research stations in Nebraska. The end result of much of the soil fertility research is most evident in the fertilizer recommendations which are currently used by the UNL Soil Testing Laboratory.

In addition to being incorporated into fertilizer recommendations, the results of the soil fertility research are passed on to farmers through meetings and the use of the media.

Farming practices have changed over the years and methods of information delivery have also changed to keep pace with these changes. In northeast Nebraska, new and innovative approaches have been attempted through the support of soil fertility research.

These new approaches include corn clubs which focus on cost of production, corn production projects by 4-H clubs, individual consulting sessions for farmers, and farmer participation in educational efforts directed to reducing leaching of nitrate-nitrogen in the sandy soils. □



Extension soils specialist George Rehm prepares equipment for fertilizer tests as part of soil fertility research at the Northeast Station.

Opportunities and Obstacles

Women Choose Agricultural Careers

By Cheryl Westcott
and Anne Johnson

Women have always been involved in agriculture as members of the family business. Now, however, more and more young women are choosing agricultural professions for their careers and are earning college degrees in order to compete in those fields. To illustrate this national trend, three recent UNL College of Agriculture graduates were interviewed about their work and experiences since graduation. All said they faced both opportunities and obstacles on the job, but all are committed to their chosen professions.

Extension Agent

Laura Schneider is an extension agent in Franklin County. Unlike many other women professionals in extension work, she's not a home economist or a youth specialist. She's the agriculture agent for this south central county, the only female ag agent in the state.

Laura, 24, joined the Franklin County staff in September 1981 after a training period in nearby Phelps County. She earned her B.S. in entomology and general agriculture in 1979 at the University of Nebraska-Lincoln. Knowing that a master's degree was required for extension agents, she went on to earn an M.S. in weed science and was graduated in May 1981, again from UNL.

A native of Benedict, Laura says, "It was always in the corner of my mind to be an agent when I was growing up. There were no female ag agents in the state and everybody chuckled at me and said, 'Yeah, right.'"

Ever since she was in 4-H, though, she thought "an agent was the thing to be. That's part of the

reason I am now. Four-H opened a lot of doors for me." She credits extension workers Harry Hecht, Keith Neimann, Gene Bergen and especially Bernice Mettenbrink as important influences.

Laura is the second of the four daughters of Mr. and Mrs. Glenn Phillips who have a cow-calf and farming operation near Benedict. Laura was always the one who enjoyed being outdoors and so she was the likely candidate to drive the tractor. She completed nearly all the 4-H projects offered except beef—her father thought the animals were too big for her.

As graduation approached last spring, Laura and fiance Greg Schneider, 27, faced a dilemma; he also was a master's candidate in weed science and the two were looking for work in essentially the same field. The couple made a pact. Whoever accepted a job first would determine where they would locate.

As it turned out, Laura's job offer came first, on an April day she remembers as a 6 a.m. to 2 a.m. marathon. After taking her master's orals in Lincoln in the morning, she

went to Franklin for an interview with the Franklin County Board and was offered the position as ag agent and chairman that same day.

The couple was married in May 1981 and Greg is now a field agronomist for Farmland Industries at the nearby Minden Co-op. His work is "totally different" from hers, Laura says, but they can help each other with job problems.

Laura feels she is well accepted, although sometimes she'll introduce herself as the ag agent at the beginning of a phone conversation, only to have the caller ask later, "Who's the ag agent down there?"

She recalls one incident when "one old farmer came in, aided by a cane. He said, 'I want to talk to the agent.' I said, 'That's me.' 'No, no, the agent,' he said. I asked if I could help and he squinted his eyes and said, 'I don't think so.' But we got to talking and I found out he farmed with horses until pretty recently. I understood then that he didn't adapt too well to change!"

The local people show no reluctance to take her advice, she says,

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Laura Schneider, Extension agent in agriculture in Franklin County, talks with a farmer who planned to aerially seed soybeans into wheat.

CHERYL WESTCOTT is assistant instructor and ANNE JOHNSON is instructor, both in the department of agricultural communications with the Institute of Agriculture and Natural Resources.

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because most know she's their agent. She tries to be visible and writes a weekly newspaper column in addition to conducting numerous meetings.

Looking to the future, Laura would like to try to combine a family and her career. "It's not going to be easy. Two nights a week now are taken up with meetings or other work activities because this is the kind of job you don't leave at 5 o'clock," she says. Phone calls come in the late evenings and early mornings.

Although she'd like to have a family in the future, "Right now I need the experience, stimulation and rewards of a career," she says. "That's not to say I wouldn't get them with a family, but right now these (career rewards) are important to me."

Laura expects to stay in extension work for quite some time. "There's a lot of variety. I'm an information-type of person and I especially like working with youth in 4-H," she says. Franklin County now has 15 or 16 4-H clubs, up from 10 when she started.

Being a woman in a man's field has some advantages and she feels she really adds visibility to the Extension Service. "A lot of people are striving to make themselves known and I'm kind of obvious—it's easier for people to remember me.

"I enjoy it. It's quite a challenge. If you're going into a field dominated by men, you have to enjoy challenges!" she says.

Ag Loan Officer

Dixie Foster is not the first woman loan officer in the Federal Land Bank Association of Norfolk office and that's fine with the Ericson native and 1980 UNL College of Agriculture ag economics graduate.

Her predecessor "paved the way for me. She did a good job here and that's probably one of the reasons they (the Land Bank) weren't hesitant about hiring me," says Dixie, 24. She wasn't hesitant about going into an ag career, either. "When I made my career choice, I didn't question whether I'd get a job (in ag

finance). I knew that I could and I would."

Her family background was a plus, too. As a loan officer, she's in the field several days a week to gather necessary information to make credit decisions on loan applications. The youngest daughter of Dick and Bonnie Foster of Ericson, Dixie grew up on the family's ranch and helped with its cow-calf operation and Appaloosa horse sideline. "I spent as much time as possible with the ranch and that had a major influence on my career decision," she recalls.

Nine years of 4-H beef and horse (as well as sewing) projects also had a long-term influence on her career goals, but in the short term, she earned an associate's degree in accounting at Southeast Community College in Lincoln. Not content with two years of higher education, Dixie entered the University of Nebraska College of Business Administration. A semester later, she transferred to the College of Agriculture in order to combine her interest in business with agriculture.

The Protege Program of the UNL Ag Economics-Agribusiness Club strengthened her feelings about her career choice, Dixie says. The program pairs ag econ students with agribusiness professionals in their area of interest. The proteges visit their "pro" on the job several times during the year to find out what their work is really like.

Dixie was a protege with UNL

graduate Kathy Votaw, an ag loan officer at First National Bank in Lincoln, for one year, and followed with another year with Burdette Shane, a farm manager at First National. Those experiences helped Dixie solidify her career choice, as did Dr. Ron Hanson, one of the ag econ club's advisors. "He gave me a lot of support and encouragement in my career choice," she recalls.

On the job at Norfolk, Dixie has learned that the pressure can be heavy at times. From November to March there's a lot of loan activity and a lot that needs to be done all at once.

As a loan officer, she's been surprised that "people haven't reacted more strongly. For the most part, I feel well accepted by everyone I talk to. I don't have any problems I'd consider major," she says.

Her family has been supportive of her career, Dixie says, but would have been in any case. "My family is proud of me and they're proud of my career choice. Whatever decision I made was my choice, as far as they were concerned."

For other young women who are considering careers in ag finance, Dixie advises, "Think positively and have the right attitudes about what you're doing. Set a goal and work towards that goal. If that's your choice, you've got all my support."

Looking at her own future, Dixie has considered going back to the ranch, possibly from a management view, but currently, "I'm happy with



Dixie Foster, ag loan officer for the Federal Land Bank, visits a client on the farm to discuss his production plans and credit needs.

my position and I'm interested in advancing within the Land Bank right now."

Chemical Company Executive

Christine Dubs is a woman on the move, around the Midwest and up the corporate ladder at Monsanto Co.

Chris, 27, was graduated from UNL in 1977 with a degree in agricultural economics. Like many of her fellow ag econ majors, she was interested in a management career with an agribusiness firm. Unlike most of her friends, though, she chose to begin that career in sales, seeing more potential for advancement and salary increases there than in ag finance or production systems work.

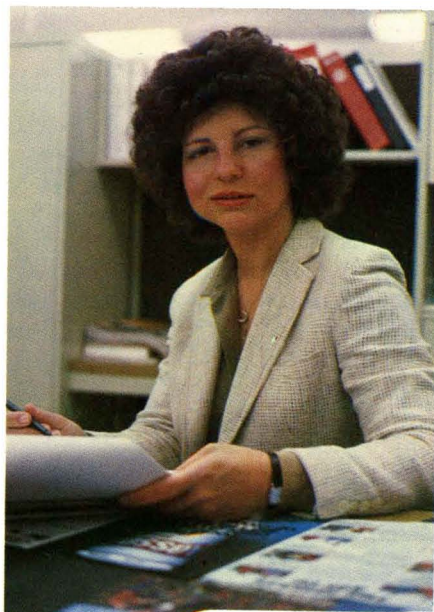
"I figured I'd better go with a large company—one that had a large number of sales representatives would have to have a lot of managers," she recalls.

Chris, who grew up near St. Edward, hadn't always planned on an agribusiness career. The daughter of Mrs. Trudy Dubs and the late Louis Dubs, she was involved in many 4-H horse projects and FFA cattle breeding projects while attending high school.

Chris spent her first year of college at Kansas State University as a pre-veterinary major, but decided her chances to get into the vet school there as an out-of-state student were pretty slim. She transferred to UNL and considered an animal science major, but again determined another route—agribusiness—would be "better to get me where I wanted eventually to go."

As a participant and then chairman of the Ag Econ-Agribusiness Club's Protege Program, Chris talked with a large number of agribusiness professionals and noted a total lack of ag sales firms in the protege program. No firms were participating because "ag sales was not popular with UNL students," she recalls, noting that the popularity of ag sales as a career has increased recently. She recruited a Ralston Purina district manager in Omaha for the program who informed her about ag sales.

During her senior year, she inter-



Chris Dubs, a project supervisor for one of Monsanto Co.'s major herbicides, divides her time between the home office and visits to her 14-state Midwest territory.

viewed with a number of companies and chose Monsanto. "They had a big, expanding sales program, and they had a history of promoting from within the company," she says.

After three months in the company's training program in Minnesota, Chris was assigned to a six-county territory in south central Nebraska, where she stayed for about two years. "The job was really great. I had a lot of contact with farmers and dealers. I didn't sell directly, but created farmer and dealer demand for Monsanto's herbicides by creating awareness of the products and their benefits for local farming and dealer practices."

Chris was invited into the company's management training program in 1979 which meant a move to the firm's world headquarters in St. Louis. As a marketing research analyst, she designed questionnaires, trained interviewers, wrote program requests and reported data for extensive studies. Research included discovering how the company's products were faring versus the competition, how its ads were being received by target audiences and where the consumer product awareness level was.

After two years in market research, Chris was promoted in January and is now a project supervisor for one of Monsanto's major herbicides, Lasso. Lasso has been on the market for a number of years, and

"we want to extend the product's sales volume by repositioning it in the marketplace to penetrate new markets," she explains. Chris is responsible for repositioning Lasso as a surface blend herbicide in 14 Mid-west states. Her new position involves marketing, distribution and program planning for farmers, dealers and distributors.

Planning toward her next career move, Chris is interested in joining one of Monsanto's regional marketing groups to expand her knowledge of strategic market planning. Or, she might become a district sales manager to gain management experience. Both are realistic possibilities in the firm's management structure.

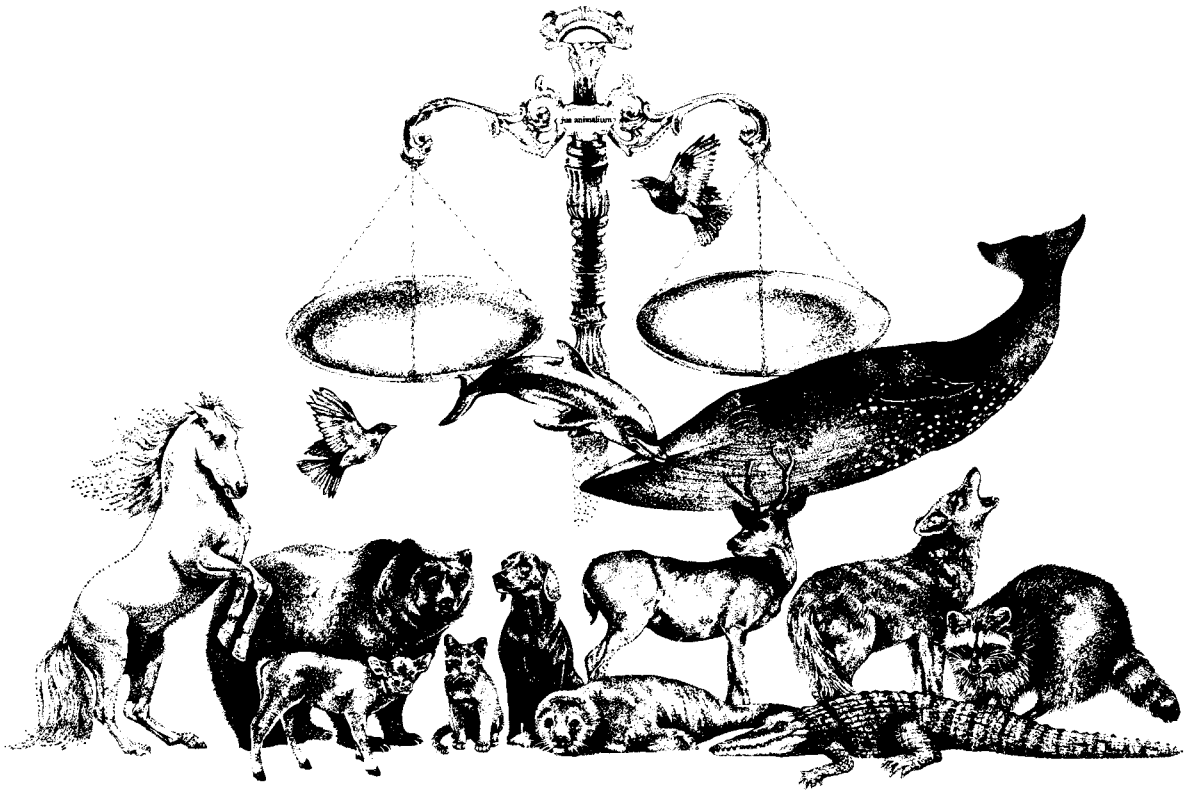
As a woman in what has been a man's field, Chris says she really believes "a woman has to be four times better to get as far as a man. Women have to prove themselves to a greater extent." Most of the men she works with respect her ideas, yet she has to work much harder to get her points accepted and her ideas considered as strong alternatives, she says. She may have to contact twice as many colleagues to sell her ideas as a man would.

Chris advises other women in agricultural corporations not to give up. "I see a lot of women who come through who've decided they'll probably not make it into management. You need to have a lot of confidence within yourself or you'll definitely start to slack off and won't make it," she says.

Chris also cautions that women need to "expand their time frame. I think women tend to want immediate rewards for jobs well done. They need to rearrange their thinking (in a corporate situation) and realize 'What I work for today may not pay me back tomorrow—I need to look down the road one or two years.'" Women must have the foresight to look ahead and at the same time keep their morale up and keep working toward their goals.

Women need "to be cognizant that they will face obstacles," Chris advises, but she adds, "The time of the token woman is basically gone. Hard work and time will help any woman reach her climb into management." □

The Animal Welfare Movement



Where did it come from and where is it going?

By Rebecca Nicholson

There is a great deal of confusion, even among so-called experts, as to the development of the animal welfare movement, its meaning, and its intent. Associated with the humane movement are many terms such as "animal rights," "animal welfare," "cruelty," and others that are often used incorrectly and often misunderstood. It is a common misconception that the animal welfare movement started fairly recently as a result of an invasion of the United States by British animal activists. In actuality, the humane movement in the United States began in the mid-1800's, and was not instigated but only influenced by the British.

History

The very first American humane legislation, known as the Body of

Liberties, was prepared by the Reverend Nathaniel Ward and was adopted by the General Court of Massachusetts in 1641. The Body of Liberties forbade any cruelties or tyranny toward animals usually kept for man's use. Various other legislative acts were created and enacted throughout the next 200 years, but for the most part were ignored by society.

Henry Bergh is the man often regarded as the founder of the humane movement in the United States. In 1863, President Lincoln appointed Bergh to the American legation to Russia, where he became aware of the cruelties inflicted upon animals. On a return trip to the United States, he stopped in London to meet with the Earl of Harrowby, the president of the Royal Society for the Prevention of Cruelty to Animals. It was there that Henry Bergh's ideas were consolidated, and upon reaching New York City he began paving the way for America's humane movement.

At this time, New York City abounded in such animal cruelties as dog and cockfights, pigeon shoots, and bear baiting. Transportation depended almost entirely on horse-drawn rail cars; there were approximately fifteen hundred cars pulled by some twelve thousand horses. The animals were sometimes whipped, overloaded, and underfed, some were driven when lame, some had their hooves eroded by salt on winter streets, and many perished in fires because they were stabled in cellars or on second floors. The best horse lasted only four or five years.

Henry Bergh developed, and was instrumental in passing, an anti-cruelty statute in 1866. The historical significance of Bergh's legislation was the coinciding power of enforcement. During the same time period, Bergh secured a state charter for formation of the American Society for the Prevention of Cruelty to Animals (ASPCA). This charter

REBECCA NICHOLSON is assistant instructor, veterinary science at the Institute of Agriculture and Natural Resources. Artwork used courtesy the Humane Society of the United States.

granted power to the group to actively enforce the new law.

The Humane Movement and Children

During the following years, Henry Bergh and the ASPCA initiated prosecution to alleged animal cruelty, with the Society winning over ninety percent of the actions. By 1870, the legal load was overwhelming and Bergh accepted the volunteer services of Elbridge T. Gerry, a young attorney. Four years later, Bergh and Gerry extended their concept of justice to include children.

In one celebrated case, an eight-year-old girl was alleged to have been regularly and severely abused by foster parents. The case was reported to several city institutions, but to no avail. As a last effort, the case was taken to the Society.

There were no child protection laws, but the ASPCA took the case on the basis that, "The child was an animal. If there is no justice for it as a human being, it shall at least have the rights of the cur (dog) in the street. It shall not be abused." Subsequent court action resulted in a prison term of one year for the foster mother. As a result, the New York Society for the Prevention of Cruelty to Children was founded in 1875.

The Humane Movement and Animals

At the federal level, Congress enacted the first law dealing with humane treatment of livestock in 1873. This legislation required animals shipped by rail to be unloaded for feed, water, and rest for at least five consecutive hours after no more than 28 hours in transit. Prior to that legislation, the transit time for livestock often exceeded 50 hours, with resulting losses from shrinkage, injury, and death. The law, revised in 1906 and known as the "28-hour law," is still in effect and has never been amended to include other forms of transit.

The humane slaughter law, enacted in 1958 and effected in 1960, specified acceptable methods for stunning animals at slaughter. It is estimated that today 80 to 85 per-

cent of all animals are slaughtered in facilities meeting the requirements of this act.

The Laboratory Animal Welfare Act of 1966 (amended in 1970, and commonly called the Animal Welfare Act), was passed to ensure humane care and treatment of laboratory animals in holding facilities or during transits. It also regulates the sale of animals for research, experimental or exhibition purposes, or as pets. The latter legislation does not include specific provisions for livestock and poultry.

Animal Rights

"Animal Rights"—you hear, see, and read about the term from many sources. Articles in newspapers and magazines appear quite often while radio and television report on it with increasing frequency. But what is meant by "animal rights"?

The term "rights" is difficult to define. Philosophers identify at least three categories of rights: legal, moral, and natural.

Legal rights are most easily defined. In the United States, legal rights are limited to what is written in federal and state constitutions, the enactments of the legislatures, and decisions that judges have made over the years.

At the federal level, many laws have been passed including the Animal Welfare Act, the Endangered Species Act, the Humane Slaughter Act, and the Marine Mammal Protection Act. While these laws set rules and standards for how humans may treat animals, they do not necessarily create animal rights.

The second category of rights, natural rights, is more difficult to define. These rights are generally derived from personal beliefs about the nature of humanity, or from the will of a Divine Creator as revealed in religious writings. What natural rights animals may be entitled to, therefore, will depend largely on interpretation of religious or philosophical views.

The third category of rights is moral rights. Moral rights derive from two sources: (1) an understanding of basic characteristics and needs of living creatures, and (2) a fundamental belief in justice and fair-

ness. Some moral rights that are widely recognized include the right to adequate nutrition, the right not to be subjected to unnecessary pain, and the right to be part of a community.

No moral rights in any society are ever absolute. For example, should children not be vaccinated because the procedure causes pain? Animals have intrinsic value and have essential physical and behavior requirements which, if denied, can lead to privation, stress, and suffering.

To read some books and press articles, one would think that those who support "animal rights" believe that animals have the same rights as human beings, and that animals should not be eaten. Indeed, a small percentage of the animal rights advocates do. In reality, however, these proponents of legal rights for animals are in the minority. The majority of welfare groups are of the opinion that animals have the moral right to be treated humanely and with care on the farm and during transport and slaughter. It is not the desire of these latter groups to put the livestock producer out of business.

By the same token, it is also true that the majority of livestock producers and husbandry specialists, in the sense of welfare or care of animals, have always been concerned with animal rights.

Nebraska

The questions raised by the various groups concerned have provided an opportunity through which the general public can be educated in the ways of livestock management. The Institute of Agriculture and Natural Resources at the University of Nebraska is taking the initiative in this education and also in conducting research in the areas of stress and behavior.

It has been said that the modern consumer takes food production very casually, if not for granted. If this is the case, then everyone in animal production has a responsibility to inform adult opinion-leaders, local humane activists, business personnel, students and others about modern animal production practices. □

Center Pivot Irrigation

Runoff Analyzed on Sloping, Clayey Soil



Figure 1. Sites for this study were selected under center pivot irrigation and with varying slopes.

By A. Y. Hanna, P. W. Harlan
and D. T. Lewis

The center-pivot system has been shown to be capable of relatively high uniformity of application. Uniform water distribution is necessary for more efficient use of the available irrigation water supplies. However, the uniformity of applied moisture in the soil profile can be considerably reduced by runoff on soils having low intake rates.

Some soils in Nebraska that have been classified as unsuitable for irrigation, apparently are being irrigated successfully with sprinkler irrigation systems. These soils were classified (Nebraska irrigation guide) as unsuitable based on their erosion potential estimated from data on their slope, texture, water holding capacity, depth, infiltration rate,

etc. It was important that the adequacy of these estimates be evaluated for soils under field conditions.

Since erosion potential should be related to runoff, a study was initiated to determine if application of water through a center-pivot system produced runoff and increased the amount of soil loss from sloping soils with physical properties usually associated with a slow rate of water intake. Three sites with different slopes were selected under a center-pivot (Figure 1) used to irrigate corn in Gage County, Nebraska. These sites are described as follows:

Site 1—Crete silty clay loam, 2 percent slope.

Site 2—Wymore silty clay loam, 4 percent slope.

Site 3—Wymore silty clay loam, 8 percent slope.

The sites were located 27 ft (8.1 m) from wheel track 7, between towers 7 and 8 of an 8-tower quarter-section center-pivot system.

The area was chisel-plowed in November, 1976 after the corn was harvested. Corn stalks were left on the soil surface and 160 pounds of nitrogen per acre (180 Kg/ha) was

applied. The land was disked and corn planted on the contour on April 18. The field was cultivated on June 7 to loosen the soil.

Precipitation and irrigation water reaching the test site was measured by a Universal recording rain gauge and small containers (Figure 2).

Small runoff plots were constructed perpendicular to the contour at each site. Metal edging was placed around the plots at the sites. A sill plate was driven to a depth of 40 cm at the lower end of the plot. Runoff water and eroded soil sediments from the plots were collected in a 35" × 24" × 24" (90 × 60 × 60 cm) sump. The sump was lined with a sheet of polyethylene (Figure 3). Runoff was measured volumetrically and was mixed thoroughly to suspend all of the sediments. Samples consisting of 40 ml of runoff and suspended sediment were oven dried, and soil losses were calculated.

Amount of runoff and erosion

Total amount of rainfall from June 10 to September 8 was 19.34" (49.13 cm). Seven irrigations of an average of 0.8" (2 cm) at a rate of 0.8" (2 cm) per hour were made from June 10 to July 21. Irrigation was not needed for the rest of growing season because rainfall was sufficient. No runoff or soil losses resulted from an average of 0.8" (2 cm) irrigation water applied in an hour on all slopes under field conditions for corn. However, 9 of 24 rainfall events caused runoff (Table 1).

The amount of runoff from rainfall at a given site depended on soil and plant conditions and rainfall characteristics. Amount of runoff from the three sites were related to differences in slope gradient.

Total amounts of runoff from June 18 to September 8, 1977 were 1.9", 3.1" and 4.3" (4.8, 8.0, and 10.8 cm) for slopes of 2, 4, and 8 percent, respectively. These amounts represent 10, 16, and 22 percent of the

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total rainfall of the three slopes. The amount of runoff increased as slope steepness increased. Rapid increase in total runoff was observed as the slope changed from 2 to 4 percent. Further increasing slope up to 8 percent caused more runoff, but in slower rate than that from 2 to 4 percent.

Total amounts of soil loss from six of the nine rainfall events were 3.53, 3.56, and 5.66 tons per acre (1.43, 1.44, and 2.29 tons per hectare) for sites 1, 2 and 3 respectively (Table 1). Increasing slope from 2 to 4 percent apparently had no effect on amount of total soil loss. Soil loss increased by more than 60 percent when the slope changed from 4 to 8 percent.

The lack of difference in total soil losses from the 2 and 4 percent slope may be due to the presence of cracks in these soils resulting in deposition of soil sediment. On the 8 percent slope, velocity of runoff water is high and there was no time for soil sediments to settle into the cracks and most sediments remained with runoff water.

These data indicate that center-pivot irrigation system applying 0.8 inch (2 cm) of water and a rate of 0.8 inch (2 cm) per hour caused no direct runoff or soil loss from clayey soils of 2, 4, and 8 percent slopes. However, runoff resulting from medium to heavy rain on recently irrigated soils is likely to be greater than that resulting from an equivalent rain on dry soil. □



Figure 2: Precipitation and irrigation water were measured by a Universal recording rain gauge and small containers.

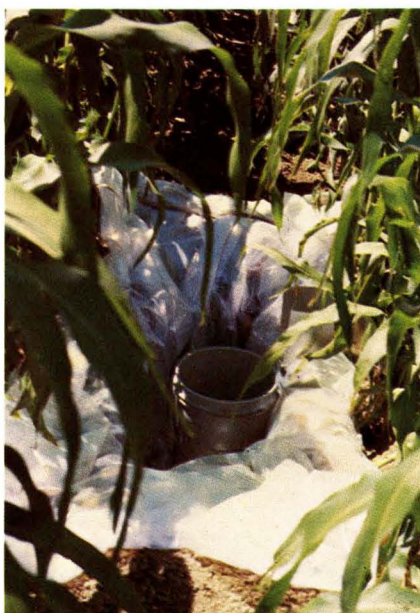


Figure 3: A sump lined with polyethylene was used to collect runoff water and eroded soil sediment.

Table 1. Amounts of Runoff and Soil Loss Resulting from Precipitation on Three Test Sites, 1977

		Dates of Runoff Events									Irrigation	Total
		6/21	6/24	8/8	8/11	8/14	8/15	8/28	9/3	9/4		
Amount of rain (cm)		2.88	1.20	1.35 2.69	2.24	2.48	8.64	.89	8.03	1.90	2.04**	33.27
Intensity (cm/hr)		.72	1.60	4.05 .77	.75	1.47	6.97	.45 .19	3.74	.28	2.04**	
		Runoff (cm)										Total
Site	Slope											
1	2%	.99	.18	.11	.00	.38	.63	.00	1.21	1.34	0	
2	4%	.56	.40	.86	1.10	1.22	.97	.18	1.37	1.38	0	
3	8%	1.00	.48	1.17	1.59	1.61	1.51	.20	1.66	1.58	0	10.80
		Soil Loss (ton/hectare)										Total
Site	Slope											
1	2%	--*	--*	.07	.0	.15	.52	--*	.42	.27	0	
2	4%	--	--	.14	.14	.19	.29	--	.36	.32	0	
3	8%	--	--	.35	.29	.49	.44	--	.45	.27	0	2.29

*Missing Data

**Irrigation

Soils Change in Nutrient Content

By Gary Zoubek,
Richard Hoormann,
and George Rehm

The rapid expansion of center pivot irrigation systems in recent years has produced many changes in Antelope and Holt counties. The change from dryland to irrigated agriculture has also produced changes in the inputs needed for crop production. For example, the amount of commercial fertilizer applied per acre increases dramatically in the switch from dryland to irrigated agriculture.

Everyone involved with crop production in the area is concerned about fertilizer management, fertilizer costs, and the potential for movement of nutrients into the groundwater. Realizing these concerns, a project was initiated in both Antelope and Holt counties to survey the nutrient content of irrigated sandy soils at the end of the 1980 growing season.

Sample Collection

Following announcements in the mass media, several farmers agreed to cooperate in the project. Samples were collected with a hydraulic soil probe from depths of 0-8 in., 8-24 in., and 1 ft. intervals thereafter to a depth of 6 ft. whenever possible. Rather than collect a large number of samples for each quarter section, the two dominant soil types in each field were sampled in detail.

The surface soil (0-8 in.) was analyzed for pH, organic matter content, available phosphorus, exchangeable potassium, and nitrate-nitrogen. All samples taken from below the 0-8 in. zone were analyzed for nitrate-nitrogen only. Routine procedures of the University of Nebraska Soil Testing Laboratory were used for all tests.

Fertilizer recommendations based on the results of these analyses were then passed on to farmers. They were free to either use the UNL fertilizer recommendations or follow fertilizer suggestions obtained from another source. A total of 123 profiles having a sandy loam or loamy sand texture at the surface were sampled. In this survey, twenty different soil types were sampled.

Increase Phosphorus Content

More than 50 percent of the samples collected had a very high level of phosphorus as defined by UNL standards (Table 1). Only two samples had a very low level of phosphorus. The phosphorus level of the remaining samples was in the low or medium category. The phosphorus level of these sandy soils commonly falls in the range of 4-9 ppm (parts per million) before the application of fertilizer.

Table 1. The phosphorus content of the surface (0 to 8 in.) samples of sandy soils in Antelope and Holt Counties, 1980.

Phosphorus Level		# of samples	% of total
0- 5 ppm	v low	2	2
6-15 ppm	low	22	18
16-25 ppm	medium	34	28
more than 25 ppm	high	65	53

Since the phosphorus level of the soil as measured by soil test is dependent on such factors as amount of phosphorus fertilizer used, the number of years in irrigated corn, soil type, and crop yields, it is not possible to provide a single explanation for the fact that a high percentage of samples had a high level of phosphorus.

Since corn does not normally respond to the broadcast application of phosphate when the soil phosphorus level is medium or high, the results of the survey do show that large applications of phosphate fertilizer can be discontinued until soil tests show a reduction in phosphorus

level on about 80 percent of the fields sampled.

Potassium Change Little

The potassium content of most sandy soils prior to fertilization normally is in excess of 125 ppm. This is a high level by current UNL standards. Some sandy soils may have initial values of 75-125 ppm. In this survey, 75 percent of the surface soils had a potassium content which was in the high or very high range (Table 2). Consequently, it would appear that there has been little, if any, major change in the potassium content of the sandy soils with repeated irrigation and fertilization.

Table 2. The potassium content of the surface (0 to 8 in.) samples of sandy soils in Antelope and Holt Counties, 1980.

Potassium Level		# of samples	% of total
less than 75 ppm	low	4	3
75-124 ppm	medium	25	20
more than 125 ppm	high	94	76

Special Nitrogen Emphasis

Nitrogen, in the nitrate form, is the most mobile plant nutrient in soils. Therefore, the management of nitrogen fertilizers is of a special concern for those producing corn on irrigated sandy soils. Using the results from the nitrate-nitrogen analysis of samples collected to 6 feet, the total amount of nitrogen remaining in the soil at the close of the growing season was computed.

More than 90 percent of the soils sampled had a carryover of nitrogen in excess of 50 lb./acre (Table 3). A substantial number of soils had a carryover of 51-100 lb./acre.

Recent studies at the Sandhills Agricultural Laboratory have clearly shown that a large amount of nitrate-nitrogen which could eventually reach the groundwater moves below the root zone between October and June. Therefore, if contamination of groundwater under these sandy soils is to be avoided, nitrogen fertilizers

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and irrigation water must be managed in a way to keep the carryover nitrogen in the soil to a minimum at the end of the growing season.

Table 3. The amount of carryover nitrogen in sandy soils in Antelope and Holt Counties, 1980.

Carryover Nitrogen lb./acre	# of samples	% of total
0- 50	10	8
51-100	48	39
101-150	36	29
151-200	18	15
201-250	5	4
250+	6	5

Because of breakdown of organic matter which releases nitrogen, non-fertilized sands will frequently have 50 lb. per acre of carryover nitrogen to a depth of 6 feet. Amounts of carryover nitrogen in excess of 50 lb./acre at the close of the growing season might be considered to be excessive. Certainly, an amount greater than 100 lb./acre would be excessive.

Carryover nitrogen in sandy soils at the end of the growing season must be held at a minimum if contamination of the groundwater with nitrogen is to be prevented.

The manner in which the nitrate-nitrogen was distributed in the sandy soils at the end of the 1980 growing season is summarized in Table 4. A relatively small percentage of the total amount of nitrate-nitrogen was present in the 0-8 in. surface zone. When all samples were averaged, 37 percent of the total was present in the top 24 in. The top 3 feet contained an average of 54 percent of the total amount of nitrate-nitrogen present to a depth of 6 feet.

Table 4. The accumulated percentage of nitrate-nitrogen in some sandy soils in Antelope and Holt Counties at the close of the 1980 growing season.

Depth in.	Low	High	Average
	% of total		
0- 8	5	29.0	8.8
0-24	8.5	81.4	37.0
0-36	15.1	87.3	53.9
0-48	21.1	92.4	67.5
0-60	36.7	98.0	83.7

The data in Table 4 also show that there was a large amount of variability of nitrate-nitrogen at the various depths. For example, only 8.5 percent of the total nitrate-nitrogen was

present in the 0-24 in. zone in one field while in another field 81.4 percent of the total was present in the 0-24 in. zone.

The results of this survey (Table 4) also show that the accuracy of determining the amount of residual or carryover nitrate-nitrogen in sandy soils can be increased if soil samples are collected to a depth of 3 feet. It's impractical for individual farmers to sample to a depth of 6 feet. Soil probes which are in common use today, however, can be easily used to collect samples to a depth of 3 feet. The suggested sampling procedure for irrigated sandy soils is to collect samples from 0-8 in., 8-24 in., and 24-36 in.

Nutrient Content and Yields

There are some who advocate that corn yields will increase if the levels of phosphorus and potassium in soils are raised from relatively low to relatively high. To test this concept for sandy soils, cooperating farmers were asked to report their yields and fertilizer programs for the 1978, 1979, and 1980 growing seasons. Twenty-seven farmers responded to this request.

The farmers who had fields with a low (6-15 ppm) phosphorus level averaged 135 bu./acre over the 3-year period. For those with a medium (16-25 ppm) level, the 3-year average was 132 bu./acre. The average yield for the same time period was 128 bu./acre for those having fields with a high (more than 25 ppm) level of phosphorus.

Considering carryover nitrogen, the farmers having fields with 51-100 lb./acre had a 3-year average of 129 bu./acre. The average yield was 120 bu./acre and 137 b./acre for farmers having fields with carryovers of 101-150 lb./acre and 151-200 lb./acre respectively. The average 3-year yield for fields having in excess of 200 lb./acre carryover was 118 bu./acre. These averages indicate that management practices other than fertilizer use were primarily responsible for the lower yields.

The results obtained from this survey clearly show that high yields are simply not the result of the application of large amounts of fertilizer. Also, the build up of the nutrient content of the soil was not the key to

achieving high yields in sandy soils. Many other management inputs are involved.

Adjusting Nitrogen Recommendations

The results of the tests for nitrate-nitrogen shown earlier suggested that the amount of nitrogen needed for corn production could be reduced on many fields. Fourteen farmers agreed to test the UNL nitrogen recommendation against a nitrogen recommendation from another source. Yields which resulted from each suggestion were measured in the fall of 1981.

Space does not permit a discussion of each of the 14 situations. So, the averages are presented as follows:

	UNL Suggestions	Other Suggestions
Ave. amount of N Applied (lb./acre)	61	144
Ave. yield (bu./acre)	150.1	151.8

The difference of 1.7 bu./acre is very small and is within the range of natural variation of yields in any field. The measurement of carryover nitrogen to a depth of 6 feet as a basis for nitrogen fertilizer recommendations resulted in a reduced nitrogen rate of 83 lb./acre. At current prices for anhydrous ammonia, this reduction in nitrogen usage translates into a savings of \$11.63/acre.

The fourteen cooperating farms have shown that the measurement of carryover nitrogen is a management tool that can be used successfully in arriving at accurate recommendations without causing any reduction in yield. The project also showed that most fields have residual nitrogen accumulation that can be successfully recovered.

It's impossible to prevent the movement of some nitrate-nitrogen to the groundwater—even under the non-fertilized native prairie. However, with continued refinement in the management of nitrogen fertilizers and irrigation water, this movement can be substantially reduced.

Recovering unused nitrogen increases the efficiency of the fertilizer applied, reduces the amount of nitrogen fertilizer needed, and reduces the potential for movement of nitrate-nitrogen to the groundwater. □



The following projects have been recently approved by the Nebraska Agricultural Experiment Station. For further information concerning these projects, contact the project investigators through the Institute of Agriculture and Natural Resources, University of Nebraska—Lincoln.

NEB 91-020—Nutrient Bioavailability: A Key to Human Nutrition.

Investigators: C. Kies and H. M. Fox, Human Nutrition and Food Service Management

The objectives of this project are to determine the biological availability in human subjects of water soluble vitamins and trace minerals, and to assess the factors affecting the availability of these nutrients.

NEB 10-087—Evaluating Financial Markets for Agriculture.

Investigators: P.H. Gessaman and G.A. Helmers, Agricultural Economics

The objectives of this study are to identify determinants and make projections of aggregate capital and credit demands in agriculture, and to evaluate the ability of financial markets to provide for those demands; and to evaluate innovations in financial markets for agriculture.

NEB 11-067—Irrigation Scheduling Methods for Efficient Water and Energy Use.

Investigators: J.R. Gilley and D.G. Watts, Agricultural Engineering

The objectives of this project are improved water balance techniques for use in irrigation scheduling; improved irrigation water and nutrient application timing criteria for the variable climatic conditions of the region; and simulation models of the soil-water-plant irrigation system as tools for evaluating alternative irrigation management strategies.

NEB 11-063—Energy and By-Products from Animal Manure.

Investigator: D.D. Schulte, Agricultural Engineering.

The objectives of the project are conversion of animal manure into usable energy; purification, storage, and conversion of energy forms and integration of energy projects into the overall farm energy needs; recovery and conversion of energy process residues into nutritional and disease-free feed components and recovery of plant nutrients from process residues emphasizing economics and labor requirements for storage and application.

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